UNIVERSITI TEKNOLOGI MARA

STRENGTH AND CHARACTERISTIC OF COMPOSITE MODELLED OF KAOLINITE CLAY AND CRUSHED SILTSTONE AS LANDFILL LINER

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with regulations of Universiti Teknologi MARA (UiTM). It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and *Regulation for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.*

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ABSTRACT

This thesis presents the findings of laboratory work on behavior of landfill liner using crushed siltstone and kaolinite. The selection of landfill liner are based on compatibility with the soil environment, resistance of load from waste, and also groundwater levels. Inspired by using waste material as engineering purpose, therefore this study is to determine the physical properties of composite kaolinite clay-crushed siltstone liner, to predict the effect of composite on hydraulic conductivity and engineering characteristic of composite kaolinite clay-crushed siltstone liner and also to analyze the settlement result by using Plaxis Modelling. There is a paucity of the previous research, where the study on the liner material is lacking. Therefore, in the present study, an alternative liner made of composite material is studied and developed. The waste material that had been used in this studied was crushed siltstone which then sandwiched with kaolinite layers and vice versa. The crushed siltstone and kaolinite clay was modeled in laboratory by sandwiching them in layer according to proportion thickness of intermediate layers range between 10% to 50%. Several geometry profiles were developed in which siltstone is placed at the middle and vice versa. All specimens were prepared and tested in accordance with BS 1377 standard. From the observation by conducting the testing, the physical properties of specimens was meet the requirement of Environment Protection Health (EPA). Strength characteristics of each composite were analyzed and discussed accordingly. Furthermore, it was noticed that the composite material can influence the compressive strength of composite materials. Strength is increased when the siltstone layer is located as an intermediate layer. Instead, the strength was decreased when the clay layer acts as an intermediate layer. Furthermore, it showed that the different geometric profiles had also influenced the hydraulic conductivity of flow rate. The crushed siltstone permits higher permeability as compared to kaolinite which gives a low permeability. As conclusion, combination of these two materials as laminated material provided a good requirement in term of strength of liner and also hydraulic conductivity for liner. The finding has contributes some knowledge and information regards to the use of waste material in geo-environmental engineering application.

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